

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of)	
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Inventors: Alan John HOPPER, et al.)	Confirmation No. 7148
)	
Appln. No. 10/528,583)	Group Art Unit: 1792
)	
Filed: August 19, 2005)	Examiner: Tadayyon-Eslami, T.T.
)	
Title: PROCESS)	

RESPONSE TO OFFICE ACTION

Commissioner of Patents and Trademarks
U.S. Patent and Trademark Office
Randolph Building
401 Dulany Street
Alexandria, VA 22314

Sir:

In response to the Office Action dated August 19, 2009, reconsideration of this application is requested.

The Examiner has indicated in response to the applicants' arguments that the previous Section 103(a) rejections have been withdrawn based on applicants' remarks of April 24, 2009 (see ¶ 4, page 10 of the Examiner's action). However, the Examiner now states that, on further consideration, new grounds of rejection have been made based on the newly cited Chen et al. published U.S. patent application (No. 2003/203994). However, with respect, the applicants submit that Chen et al. (hereinafter "Chen") do not fill in the substantive deficiencies of the other prior art relied on by the Examiner. Stated otherwise, the applicants submit that their claims define subject matter which is not in any sense obvious from a consideration of the Examiner's references. Accordingly, favorable reconsideration of the Examiner's Section 103(a) rejections, with allowance, is requested.

In responding to the applicants' previous arguments that none of the previously cited references teach an ink that comprises less than 2 parts of organic solvent, the Examiner states that the newly cited Chen reference "teaches a solventless ink and is substantially free of

organic solvents" (§ 5, page 10 of the action). The Examiner concludes from this that it would be obvious to use the solventless ink of Chen in the method of Lent et al. ("Lent") and it is primarily on this basis that the Examiner has rejected applicants' claims. However, as discussed in detail below, the Examiner's proposed combination of references clearly disregards what the references actually teach. It is noted in particular that the Examiner's primary reference (Lent) requires the use of large amounts of organic solvent for the inks contemplated therein. Clearly, in the circumstances, it is not appropriate for the Examiner to disregard a clear requirement of Lent to frame a basis for an obviousness rejection. The Examiner's references are what they are and they teach what they teach and it is not proper for rejection purposes to disregard or replace features considered essential by one reference to somehow arbitrarily fit references together in an effort to meet an applicant's claim language. Manifestly, the prior art must suggest the reference combination the Examiner relies on and, in the present case, there is no reasonable suggestion in the art to make the changes required in Lent to reach the applicants' invention.

Looking at the issues more specifically, the Examiner has rejected claims 1, 2, 5, 11, 15, 18, 24-25 and 28 under Section 103(a) as unpatentable over Lent et al. (U.S. 5,270,368) in view of Chen et al. (U.S. Patent Application 2003/203994). As indicated above, these references do not make the applicants' invention obvious. There is, in particular, no teaching, suggestion or motivation in the references to warrant the Examiner's selective combination of features from these references in an effort to meet the applicants' invention.

The rejected claims are drawn to (a) process for making an electronic device using a solder mask ink applied by ink-jet printing (claims 1, 2, 5, 11, 15, 18 and 24); (b) non-aqueous solder mask ink (claim 25); and (c) an ink as defined in claims 25, 26 and 27 (claim 28).

Claim 1, the applicants' main process claim, requires, inter alia, that:

- (1) the ink is a solder mask ink;
- (2) the solder mask ink comprises 0-10 parts of polymer and/or prepolymer (D);
- (3) the ink includes no greater than 2 parts of organic solvent (G); and
- (4) the ink is applied by ink-jet printing.

The Examiner's references do not suggest a process characterized by the indicated combination of features. To start with, the Examiner is incorrect when he states (page 3, lines 8-10 of the action):

"The composition taught by Lent also is free of organic solvents and is a non-aqueous composition (not including water)."

With respect, and as argued in applicants' response of April 24, 2009, Lent does not disclose solvent-free inks; on the contrary, it is clear that Lent requires the presence of substantial amounts of organic solvent as an essential feature of his invention. In this connection, the Examiner is requested to consider Lent claim 1, (Component C); the Abstract of the patent; Column 3, lines 48 to 65; Column 6, lines 13 to 28; Column 7, lines 53 to 61 thereof. It is clear that organic solvent must be present in the Lent inks and preferably in very large amounts of from 30 to 60% (Column 6, lines 25 to 28). Note further in this regard, Example 1 and the other Examples of Lent where the inks contain massive proportions of organic solvents (e.g. Example 1, methanol, e.g. 53% and MEK 2.5%) as is also evidenced by Column 8, lines 47-48; Column 9, lines 9 to 10, lines 35 to 36 and 63 to 64 of the patent.

In stark and incompatible contrast Chen requires solventless compositions (Claim 1; Column 2, [0007], [0016] and [0021]). As the applicants have previously noted (see page 8, last paragraph of the applicants' April 24, 2009 response), it is not logical or reasonable and certainly far from obvious to combine one document (Lent) which teaches high organic solvent inks are essential and another which teaches solventless compositions (Chen). The person of ordinary skill would correctly assume the teachings of Lent and Chen to be incompatible and the results of any combination would, at the very least, be highly unpredictable. The applicants submit that it is only with hindsight based on applicants' disclosure that an effort would be made to replace Lent's solvent with Chen's solvent-free system. Clearly, the references do not suggest such a modification; instead, if anything, they teach away from it. In fact, since Lent discloses ink jet printing and Chen does not, it would be logical that the person of ordinary skill would stick with the high solvent compositions of Lent in order to retain an ink taught to be suitable for ink jet printing. Nothing in Chen remotely suggests his compositions to be suitable for ink jet printing. In fact, to the contrary, the Chen compositions (especially the high proportions of epoxy binder) indicate a composition which is too viscous and therefore unsuitable for ink jet printing.

The applicants submit that the foregoing should be sufficient to show that the Examiner's reference combination is not warranted and that the applicants' invention as defined in claims 1, 2, 5, 11, 15, 18, 24, 25 and 28 is not obvious from any reasonable reading of the Lent and Chen references, and should be found patentable thereover. However, there are even further

reasons in support of the patentability of the applicants' claims. In this connection, the applicants note the Examiner's comments (page 3, lines 5-8 of the action) that:

"Although Lent does not clearly teach the mask is a solder mask or for applying solder to the substrate, however it is obvious that the mask is capable to be employed as a solder mask because Lent teaches the mask is suitable to apply metal layers on it".

The Examiner makes a similar comment at page 10 (point 6) of the action. With respect, however, the applicants are unable to find any basis in Lent itself to indicate any suitability in the Lent mask to apply metals thereon. To the contrary Lent is an etch resist, i.e. a resist to etching (removal) of metal. There are very different technical and functional requirements for etch resists and solder masks as those in the art will recognize and the concept or presumption that an etch resist must function as a solder resist is technically unsustainable.

To restate the applicants' position, it is noted that Lent relates to etch-resists and does not mention solder masks. The Examiner admits that Lent does not teach that his mask is a solder mask (page 3, lines 5-6 of the action). Furthermore, the substantive differences between a solder mask required by the applicants and the etch-resist called for by Lent, and their respective uses, precludes any presumption that the two are interchangeable. Etching, e.g. etching of copper is typically performed by exposing a copper laminated dielectric board to an aqueous bath containing a chemical etchant such as copper (II) chloride, ammoniacal copper (II) or ferric chloride. Etching may be performed at room temperature or up to 60°C. In stark contrast, soldering is performed using molten solder typically at high temperatures of around 260°C or higher. See page 10, line 40 of the applicants' disclosure. Solder masks also require high hardness, good electrical and solvent resistance (flux). See page 11, lines 1 to 7 of the present application.

An etch resist ink is generally removed from the final electronic device (e.g. PCB) while a solder mask is generally retained. Thus, an etch resist cannot have adhesion which is too good while a solder resist should have excellent and long lived adhesion.

Clearly, the person of ordinary skill in the art would recognize that something mentioned as an etch-resist ink provides no presumption of use as a solder mask ink. In fact, it tends to point to a very different ink having very different properties. Particularly important is the fact that etch resists do not require high temperature and flux resistance whereas solder masks do. Accordingly, the suitability of an etch resist for soldering cannot be presumed.

Even if the Examiner could find basis for the generality of metal layer application to the etch resist in Lent metals layers can be applied by any number of known methods e.g. electroplating, chemical vapor deposition, metal salt reduction, etc. None of these connote the high temperature resistance which are specific to soldering.

In short, the applicants respectfully submit that the person of ordinary skill would think that:

- i. Lent which relates to etch resist inks; and
- ii. Chen which relates to solder mask compositions

are distinct and very different because the properties, functionality and method used in their manufacture are very different. Accordingly, the applicants respectfully submit that the Examiner's assertion regarding the suitability of the etch resists in Lent as a solder mask is not in any sense well taken.

The Examiner's position appears to be summarized at page 4, lines 3-7 of the action:

"Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention was made to have a method of making an electronic device as Lent and Chen teach where the amount of each ingredient in solder mask is based on claim 1, because the optimum workable ranges obtained by routine experimentation".

The applicants do not understand the Examiner's position as stated above. However, it is noted that Chen teaches 63 to 70% by weight of epoxy resin binder to be present in the Examples. This is well outside the language of applicants' claims (feature D). The only teaching in Chen regarding amounts is that expressed in the Examples. Thus Chen, if anything, teaches away from the applicants' requirement D) of applicants' claim 1 and claim 25. Clearly, in Chen, the epoxy resin is the core of the invention. This contrasts starkly with the compositions of Lent which are binder free or contain very low levels of binder. Accordingly, it is submitted that the teaching of Lent and Chen would not lead to the applicants' ink compositions by any kind of routine experimentation based on the reference teachings.

Finally, it is noted that the applicants' claims are concerned with ink-jet printing. The large amount of binder in Chen's compositions results in a high viscosity which would be unsuitable for ink-jet printing. Thus, Lent is directed to etch resists designed for ink jet application while Chen does not show suitability of his different compositions for ink jet application and strongly suggests unsuitability because of the high viscosities of the formulations used e.g. Chen, page 3, Table 2 which contain 125 to 182 parts binder in about

198 to 258 parts of the composition, i.e. 63 to 70% binder. Thus, the person of ordinary skill, in considering Lent, would not be motivated to consult the teaching of Chen because it would be understood that the compositions of Chen would not be suitable for ink jet printing.


For all of the above reasons, the applicants submit that their claims 1, 2, 5, 11, 15, 18, 24, 25 and 28 define subject matter which is not in any way obvious from the Lent and Chen references. There is no valid basis to view these references in combination because of the substantive differences which exist in their respective compositions, methods and purposes. However, even if the references should be considered together, the applicants' invention would not result. Accordingly, reconsideration and withdrawal of the Section 103(a) rejection of claims 1, 2, 5, 11, 15, 18, 24, 25 and 28 is requested.

The applicants also respectfully submit, for essentially similar reasons, that the Examiner's Section 103(a) rejections of (1) claims 4 and 6-8 as unpatentable over Lent, Chen and '376; (b) claim 3 as unpatentable over Lent in view of Chen and Sasaki; (c) claims 9-10 and 26 as unpatentable over Lent in view of Chen and Sato; and (d) claims 16, 27 and 28-29 as unpatentable over Lent, Chen and 398 as set out on pages 5-9 of the action, should be withdrawn. The further references relied on by the Examiner to make these rejections (376, Sasaki, Sato and 398) do not fill in the substantive deficiencies noted above with respect to Lent and Chen.

The Examiner's attention is called to the Information Disclosure Statement and PTO-1449 filed herewith.

Allowance is thought to be in order and is requested/

Respectfully submitted,
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By _____

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Date: November 19, 2009

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